III. ENVIRONMENTAL RESOURCES AND NEEDS

The LWC Planning Area contains a wide variety of natural resources, ranging from its coastal barrier islands, mangrove forests, bays, beaches and estuaries to its inland mosaic of forested, shrub/scrub and herbaceous wetlands and uplands. Many of these areas are public and private preserves, aquatic preserves, and lands proposed for public acquisition (Figure III-1). In this chapter, inland resources and coastal resources are addressed separately, even though they are an ecological continuum. The inland resources include lakes, rivers, canals, freshwater wetlands and uplands. The coastal resources include estuaries, tidal wetlands, beaches, sand dunes and barrier islands.

This chapter also addresses the "Outstanding Natural Systems" (ONS) within the LWC Planning Area. Through the water supply planning process, an ONS map was created "to identify the natural systems that should receive a higher level of review to protect them from deleterious impacts resulting from permitted water use, in order to maintain the ecological function of the region." The ONS map (Plate 2) delineates large areas that are relatively pristine natural systems and areas with valuable habitat that have been modified by human activities. Two categories of ONS lands are identified on the map: ONSe and ONSm. The ONSe lands are areas that have been purchased for environmental preservation/ conservation purposes. The ONSm lands are natural systems that are currently used for multiple purposes (i.e., agriculture, residential, water supply, surface water management etc.).

INLAND RESOURCES

Inland Southwest Florida has numerous freshwater swamps, sloughs, and marshes. A number of these systems are relatively pristine wetland areas and are recognized as having national and regional importance (e.g., Big Cypress National Preserve, Corkscrew Swamp Sanctuary, and Fakahatchee Strand). These wetland areas serve as important habitat for a wide variety of wildlife and have numerous hydrological functions.

Before development of the region, inland areas were comprised of vast expanses of cypress and hardwood swamps, freshwater marshes, sloughs, and flatwoods. Scattered among these systems were oak/cabbage palm and tropical hammocks, coastal strand and xeric scrub habitats. A large portion of the area contained seasonally flooded wetlands which sheetflowed fresh water from the northeast to the southwest.

Wetlands

Wetlands, in general terms, are lands transitional between uplands and aquatic systems, and are defined by plants, soils, and hydrology. A more technical definition, as defined by the U.S. Army Corps of Engineers (1988), identifies wetlands as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." The major types of freshwater wetland systems within the LWC Planning Area are forested, scrub/shrub, and herbaceous wetlands.

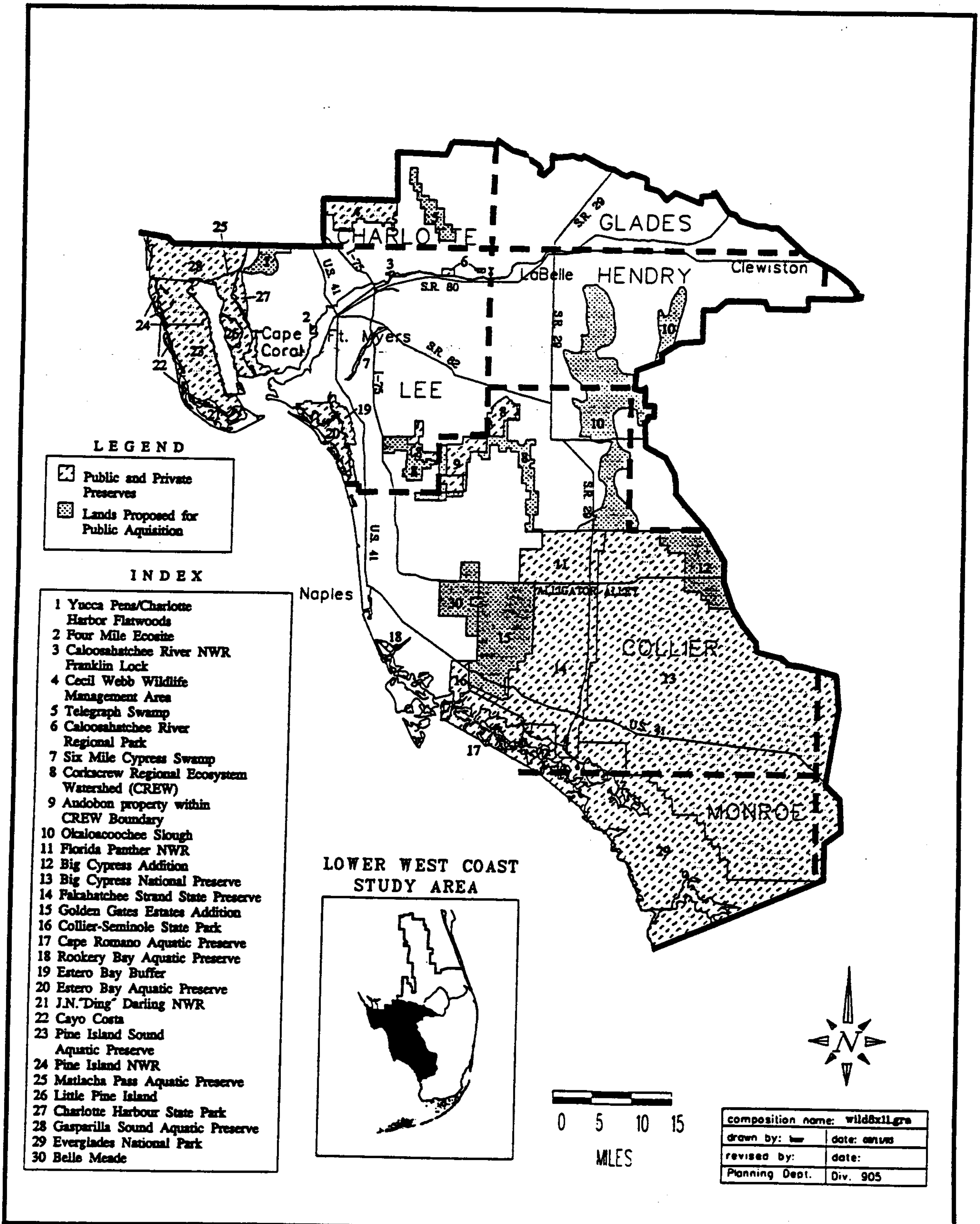

FIGURE III-1. Public and Private Preserves, Aquatic Preserves, and Lands Proposed for Public Acquisition.

Distribution of Wetlands in the LWC Planning Area

Wetland systems in the LWC Planning Area were classified and delineated by the National Wetlands Inventory (NWI), a branch of the U.S. Fish and Wildlife Service. The NWI is a nationwide wetland mapping system which was completed for the state of Florida in 1984. This wetland inventory was used as a base against which changes in wetland distribution were detected in the planning area. The NWI data was updated by the District using 1990 and 1991 satellite images and aerial photographs. This update was not a detailed re-evaluation of the LWC Planning Area wetlands, but a generalized overview of the changes that have occurred in the region since the original NWI maps were created. Plate 3 shows the updated wetland systems map of the LWC Planning Area. The major wetland systems are described below for the counties within the planning area. These wetlands can be found in Figure III-1.

Charlotte County. In eastern Charlotte County, a portion of Cecil Webb Wildlife Management Area and Telegraph Cypress Swamp cover nearly 10,000 acres. Both systems are diverse with a mixture of low pine flatwoods, cypress strands and marshes.

Collier County. In Collier County, major wetland areas include the Okaloacoochee Slough, Fakahatchee Strand, the Big Cypress National Preserve, and the Corkscrew Regional Ecosystem Watershed (CREW lands).

Okaloacoochee Slough is one of the two most important surface water flowways in Collier County, with Lake Trafford-CREW being the other (Gore, 1988). This slough system is composed largely of herbaceous plants with trees and shrubs scattered along its fringes and central portions. It provides habitat for a wide array of wildlife such as the endangered Florida panther.

Fakahatchee Strand is the southwest branch of the Okaloacoochee Slough. The strand contains a diversity of plant communities such as, mixed hardwood swamps, cypress forest, prairies, hammocks, pine forest, and pond apple sloughs. There are at least 30 species of plants and animals in the strand that are considered endangered, threatened, or rare by the State of Florida (U.S. Fish and Wildlife Service, 1984).

Big Cypress National Preserve encompasses a vast area (570,000 acres) within Collier County. Habitats within the preserve are primarily cypress forest, pine flatwoods and marshes. There are in excess of 100 species of plants and 20 species of animals in the preserve listed by the state as endangered or threatened.

CREW is a large project covering 50,000 acres in Lee and Collier County and consists of Corkscrew Sanctuary, Corkscrew Swamp, Camp Keais Strand, Flint Pen Strand, and Bird Rookery Swamp. CREW lands are dominated by cypress forest, low pine flatwoods, hardwood hammocks, marshes, mixed swamps and ponds. This system provides valuable habitat which supports at least 65 species of plants and 12 species of animals listed by the state as endangered or threatened.

Glades County. The major wetland in western Glades County is Fisheating Creek. Fisheating Creek is an extensive riverine swamp system that forms a watershed covering hundreds of square miles. Although Fisheating Creek is located in the Kissimmee Basin Planning Area, it delineates the northern boundary of the LWC Planning Area. Fisheating Creek is the only free flowing tributary to Lake Okeechobee. The creek attenuates discharges from heavy storm events and improves water quality before the storm water enters the lake. The creek also serves as a feeding area for wading birds such as the endangered wood stork, white ibis, and great egrets, when stages in the marshes surrounding Lake Okeechobee are too high.

Hendry County. The Big Cypress Swamp occupies a large section of southern Hendry County, including part of the Big Cypress Seminole Indian Reservation. The area is characterized by cypress forests, small pine hammocks, and marshes. The headwaters of the Okaloacoochee Slough are in northern Hendry County. The slough extends southward to Collier County, where it eventually branches to the Fakahatchee Strand.

Lee County. Major wetland areas in Lee County include the Six Mile Cypress Slough and Flint Pen Strand, which is within CREW. Six Mile Cypress Slough encompasses 2,000 acres in Lee County and is dominated by cypress, interspersed with numerous ponds. The native plant communities which fringe the slough are pine flatwoods, hardwoods, and wet prairies. Heavy infestation of melaleuca has occurred in the southern one-third of the slough.

Monroe County. The Monroe County Area lies entirely within Everglades National Park. The Everglades ecosystem supports a diverse array of tropical and subtropical plants and animals, some of which are found no where else in the world. Major plant communities include sawgrass, wet prairies, tree islands, willow heads, cypress forests, upland forests, and mangroves. At this time 18 endangered species are known to be within the park. The Everglades SWIM Plan (SFWMD, 1992) contains further information.

Functions and Values of Wetlands

Wetlands provide a wide variety of functions and values that can be grouped into three general categories: (1) biological, (2) hydrological, and (3) socioeconomic. The biological and hydrological categories are concerned with the natural "functions" attributed to wetlands, whereas the socioeconomic category is concerned with those "values" that are considered important for monetary, cultural, educational, or aesthetic purposes. All the natural functions associated with wetlands may not be apparent in every wetland. However, the importance of a wetland is not automatically diminished if all functions are not fully expressed.

Biological. Wetlands provide a number of important biological functions to the regional ecosystem, including:

- Habitat for fish and wildlife, including rare, threatened and endangered species
- Habitat utilized by adjacent semiaquatic and terrestrial species
- Areas for aquatic primary and secondary production that are a critical component of the regional food web

Wetland habitats provide a variety of usages for wildlife. Some organisms depend totally on wetlands for their entire existence, while other semiaquatic and terrestrial species use wetlands sporadically. Their dependence on wetlands may be for over-wintering, residence, feeding and reproduction, nursery areas, den sites, or corridors for movement. Wetlands are an important link in the aquatic food web. These freshwater systems are important sites for microorganisms, invertebrates and forage fish which are consumed by predators such as amphibians, reptiles, wading birds and mammals.

Hydrological. Wetlands provide a number of important hydrological functions to the regional water management system, including:

- Flood storage and conveyance
- Water quality enhancement through filtration and nutrient cycling
- Recharge and discharge areas for ground water
- Maintenance of an estuarine water balance
- Erosion control
- Evaporative surfaces for rainfall development

As stated previously, hydrology is the dominant factor which determines the species composition and wetland type that can develop within a given area. Wetlands hydrologically function as a receiving and storage area for surface water runoff. This is important in controlling flooding, erosion, and sedimentation on the regional scale. As surface water enters a wetland, water is stored until its overflow capacity is reached and water is slowly released downstream. Wetland systems, such as the floodplain of rivers, creeks and sloughs, convey water through the landscape to downstream locations. As water flows are attenuated, sediment is deposited and nutrients are assimilated, improving water quality. Some wetlands may function as recharge areas, while others function primarily as ground water discharge areas. Freshwater wetlands are an integral component of the estuarine systems in the LWC Planning Area, providing base flows of fresh water to maintain the proper salinity balance.

Socioeconomic. Socioeconomic values refer to man's monetary benefits associated with preserving the natural water resource functions of wetlands, as well as cultural and aesthetic aspects. As human values, perceptions and knowledge of wetlands change, so do perceived values placed upon wetlands.

Wetlands are a rich source of information and education. They can provide a better understanding of our cultural heritage. For instance, the remains of prehistoric Indian middens have contributed to our understanding of local Indian cultures and specifically the importance of wetlands in their everyday living. Wetlands provide social and economic benefits such as:

- Commercial and sport fisheries production
- Agricultural and aquacultural production
- Recreation
- Education and research
- Aesthetic and open space
- Cultural aspects

Uplands

Upland communities in the LWC Planning Area, as identified by the SFWMD, are shown in Plate 4. Some of the upland habitats found within the planning area are flatwoods, tropical hammocks and xeric scrub communities, with flatwoods being the dominant upland habitat. Flatwood communities are divided into two types: dry and hydric. Dry flatwood communities are characterized by an open canopy of slash pine with an understory of saw palmetto. Hydric flatwood communities are vegetatively similar to dry flatwoods. However, dry flatwoods are located in a slightly higher elevation in the landscape and are rarely inundated.

Distribution of Uplands in the LWC Planning Area

Large areas of flatwoods are found throughout Hendry and Lee counties, as well as portions of Charlotte, Glades and Collier counties. Upland flatwoods are the native habitats most affected by the expansion of citrus into Southwest Florida. Flatwoods are important habitat for a number of rare, threatened or endangered species, such as the Florida panther, eastern indigo snake, red-cockaded woodpecker and gopher tortoise. Pine flatwoods have greater richness of vertebrate species than either sand pine scrub or dry grass prairies (Myers and Ewel, 1990).

Tropical hammocks are scattered throughout the LWC Planning Area. This diverse woody upland plant community occurs on elevated areas, often on Indian shell mounds along the coast, or on marl or limestone outcroppings inland. Tropical hammocks are not widespread in occurrence, and as a result of conversion to other land uses, tropical hammocks are among the most endangered ecological communities in South Florida.

Xeric, sand pine scrub communities most commonly occur along sand ridges and ancient dunes. The southernmost of these communities was once found on Marco Island in Collier County, but has since been lost to development. Sand pine scrub is most often associated with relict sand dunes formed when sea level was higher than it is today. These well-drained sandy soils are important areas of aquifer recharge for coastal communities. The sand pine scrub is the most endangered ecological community present within the LWC Planning Area. It is rapidly being eliminated by conversion to other land uses.

Functions and Values of Uplands

Upland plant communities (e.g., flatwoods, sand pine scrub) serve as recharge areas, absorbing rainfall into soils where it is distributed into plant systems or stored underground within the aquifer. Ground water storage in upland areas reduces runoff during extreme rainfall events, while plant cover reduces erosion, and absorbs nutrients and other pollutants that might be generated during a storm event.

With a few exceptions, the functions and values attributed to wetlands also apply to upland systems. As stated earlier, the upland/wetland systems are ecological continuums, existing and adapting to geomorphic variation. The classification of natural systems is artificial and tends to convey a message that they survive independently of each other. In reality, wetland and upland systems are interdependent on each other. To preserve the structure and functions of wetlands, the linkage between uplands and wetlands must be maintained (Mazzotti *et al.*, 1992).

WATER NEEDS OF THE INLAND ENVIRONMENT

Both the needs and functions of natural systems must be considered as part of the overall water supply planning process. Regional water supply plans are developed to first ensure that the water supply demands of the environment are met and that enough fresh water is available for urban, industrial and agricultural uses. Wetland and upland communities play an integral role in maintaining regional water supplies by allowing for natural recharge of the aquifers.

Wetland Water Supply Needs

The needs of wetland systems are dependent upon a number of factors including hydrology, fire, geology and soils, climate, and ecological succession (see "Factors Affecting Wetland Water Needs" in Appendix F). Hydrology is the dominant influence regulating wetland community structure and function. Actions that modify or alter wetland hydrology also significantly affect the species composition and ecology of wetland ecosystems. Lowered ground water tables in areas surrounding wetland communities have been shown to decrease surface water depths and shorten the hydroperiod (length of time that standing water inundates a wetland). The most obvious impact of reducing water levels is a decrease in the size of the wetland. This is especially true of shallow, low gradient wetlands, which may be entirely eliminated. Decreased wetland size reduces the available wildlife habitat and the area of vegetation capable of nutrient assimilation. It also reduces the water surface area and corresponding evapotranspiration rates, which can have an influence on the rain cycle and regional climatic conditions. Lowered water levels and reduced hydroperiod also (a) induce a shift in community structure towards species more characteristic of drier conditions, (b) reduce rates of primary and secondary aquatic production, (c) increase the frequency and/or intensity of fire, (d) cause the subsidence of organic soils, and (e) allows for exotic plant invasion. Maintaining appropriate wetland hydrology (water levels and hydroperiod) probably is the single most critical factor in maintaining a healthy wetland ecosystem (Duever, 1988; Mitsch and Gosselink, 1986; Erwin, 1991).

Studies of Southwest Florida wetland communities indicate that species composition and community type are largely determined by water depth and hydroperiod (Carter *et al.*, 1973; Duever, 1984; Duever *et al.*, 1986). Some wetlands types contain water depths of three feet or more and are inundated year-round, while other community types are characterized by saturated soils or water depths of less than a few inches that inundate the land for relatively short periods of time during the wet season. Wetland plant species adapted to deep water and long periods of inundation are generally not well adapted to shallow water or a shortened hydroperiod. Complete drainage of a wetland severely alters wetland community organization and species composition. Partial drainage of wetlands can be caused by ground water withdrawals in adjacent upland areas. These withdrawals effectively lower underlying water tables and "drain" wetlands (Rochow, 1989). Drainage facilities such as canals and retention reservoirs constructed near wetlands have a history of draining and reducing hydroperiods of South Florida wetlands (Erwin, 1991). A major concern of reduced water depths and hydroperiod within wetlands is the invasion of exotic plants such as melaleuca and Brazilian pepper.

Rainfall, along with associated ground water or surface water inflows, is the primary source of water for the majority of wetlands in the LWC Planning Area. Rainfall in South Florida is highly variable. Although the region has a distinct wet and dry season, the timing and amount of rainfall which falls upon a particular wetland varies widely from year to year. As a result, wetland hydroperiod also varies annually. Hydroperiod information collected from a wetland during a series of wet years may vary considerably from data collected during a dry year. This wide variation in annual rainfall makes it difficult to determine what the appropriate water level or hydroperiod should be for a specific wetland ecosystem. Determining appropriate water level or hydroperiod conditions for a wetland often requires a data collection effort that spans a sufficient period of record. Hofstetter and Sonenshein (1990) suggest alterations that shorten hydroperiods may be detectable within 8 to 10 years.

Several attempts have been made by researchers to define annual inflows and water budgets for some of the larger wetland ecosystems present within the LWC Planning Area such as the Big Cypress Swamp (Klein *et al.*, 1970; Freiberger, 1972; Carter *et al.*, 1973; Duever *et al.*, 1979, 1986), Corkscrew Swamp (Duever *et al.*, 1974, 1975, 1976, 1978), Fakahatchee Strand (Burns, 1984), and Six Mile Cypress (Johnson Engineering *et al.*, 1990). However, no data currently exists which quantifies the environmental water demands for the region.

Current computer modeling programs focus primarily on describing the volume of water available within the various aquifers underlying wetland communities. Although numerous wetland models are available (Mitsch *et al.*, 1988), few regional models exist which have the resolution and sophistication to quantitatively estimate the amount of surface water present or available within the LWC Planning Area wetlands. Although several models could be used to estimate water levels or hydroperiods which should be maintained to protect these systems, their accuracy is questionable. In addition, relatively little long-term hydrological data exists to run these models. In short, no data or model with a high resolution of accuracy currently exists which can describe the volume of water necessary to maintain the LWC Planning Area wetlands in their present condition.

Upland Water Supply Needs

The water supply needs of upland plant communities are not well known. It is assumed that the upper six to ten feet of the surficial aquifer is utilized by forest and herbaceous plant vegetation. Flatwoods are the dominant upland habitat within the LWC Planning Area. These plant associations are characterized by low, flat topography and poorly drained, acidic, sandy soils. In the past this ecosystem was characterized by open pine woodlands and supported frequent fires (Myers and Ewel, 1990). Three factors (fire frequency, soil moisture, and hydrology) play important roles in maintaining plant community structure and function and are also considered important as determinants of the direction of plant community succession. Fire is the factor which most strongly influences the structure and composition of upland plant communities.

Fire, under natural conditions, maintains flatwoods as a stable and essentially nonsucessional plant association. However, when the natural frequency of fire is altered by drainage improvements and construction of roads and other fire barriers flatwoods can succeed to several other plant community types. The nature of this succession depends on soil characteristics, hydrology, available seed sources or other local conditions (Myers and Ewel, 1990).

The hydrology of upland plant communities varies with elevation and topography. Seasonal variations as well as local withdrawals from ground water play an important role in determining the type of upland vegetation that will develop.

Wildlife Water Supply Needs

In South Florida, the dominant physical factors which influence the species composition, distribution and abundance of wildlife are the annual pattern of rainfall, water level fluctuations, and fire, as well as occasional hurricanes, frosts and freezes. Biological factors such as predation, competition and feeding habits also play important roles in configuring wildlife communities.

Alterations in water depth and/or hydroperiod that result in changes to vegetative composition and diversity may lead to the degradation of fish and wildlife habitat. One of the causes of melaleuca infestation is a decrease in water table levels which, when a seed source is present, can result in monotypic stands of tightly packed trees that have the potential to cause a localized decrease in biodiversity.

Wetland vegetative productivity usually exceeds that of other habitat types. Reduction in size of a wetland reduces food production at the bottom of the food chain. Alterations of the seasonal wet and dry pattern can also cause impacts. "The life cycle of many species are tied to this cycle. Wood storks, for example, are unable to successfully fledge their young without the dry season concentration of food. Anything that interferes with the cycle, too much water in the dry season or not enough in the wet season, tends to reduce fish and wildlife populations" (University of Florida, Center for Government Responsibility, 1982).

Flooding of wetlands during the summer months initiates the production of aquatic plants such as attached algae (periphyton) and macrophyte communities. These plants are consumed by small fish and invertebrates. Maximum numbers of fish and invertebrates occur near the end of the wet season. As marsh water levels decline during the dry season, these organisms are concentrated into smaller and smaller pools of water where they become easy prey for wading birds and other species of wildlife. Fish and invertebrates are the major dietary components of South Florida wading and water bird populations. Wading bird nesting success is highly dependent upon the natural seasonal fluctuations in hydroperiod of these marsh systems and the concentration of food resources. Kahl (1964) and SFWMD (1992) link the nesting success of wood storks and white ibis to the hydrologic status of regional wetland systems.

COASTAL RESOURCES

Southwest Florida has some of the most pristine and productive coastal waters within the state. Five of these areas are contained in aquatic preserves, including Matlacha Pass, Pine Island Sound, Charlotte Harbor, Estero Bay, and Rookery Bay. Tourism, the major industry in Southwest Florida, is closely linked to its unique coastal resources. The coastal resources include areas such as estuarine systems, barrier islands and beaches.

Estuarine Systems

Coastal areas are dominated by large estuarine systems where the waters of the Gulf of Mexico mix with the freshwater inflows from numerous river systems, sloughs and overland sheetflow. These estuarine areas are characterized by shallow bays, extensive seagrass beds, and sand flats. Extensive mangrove forests dominate undeveloped areas of the shoreline. Two large open water estuarine systems, Charlotte Harbor and the Caloosahatchee River estuary, dominate the northwest portion of the planning area. Other associated habitats are high salt marshes and riparian fringing marshes. More than 40 percent of Florida's rare, endangered or threatened species are found in Southwest Florida estuaries. One of the most renowned is the West Indian manatee, which depends on a healthy seagrass community as its major food source. The bald southern eagle also relies to a large extent on the estuary as its feeding grounds.

Coastal areas subject to tidal inundation support extensive mangrove forests and salt marsh areas. Coastal mangroves protect against erosion from storms and high tides, and assimilate nutrients from flowing water to produce organic matter (leaves), which forms the base of the estuarine food chain. Mangroves and salt marsh communities serve as important nursery and feeding grounds for many economically important species of finfish and shell fish, which in turn support migratory waterfowl, shore bird and wading bird populations. These brackish water communities were once commonly distributed along the entire coastline, but are now found in greatest abundance in southwest Collier County and southern Lee County. The Ten Thousand Island region, which dominates the southern portion of Collier County, is the largest intact mangrove forest in the world.

Barrier Islands

Barrier islands form a chain from northern Lee County to southern Collier County. Barrier islands also protect the mainland from major storm events, act as a buffer for sensitive estuarine areas, and provide habitat for shorebirds and wildlife. These low lying, narrow strips of sand play an important role in the region's tourism economy by attracting visitors to the beaches.

WATER NEEDS OF THE COASTAL ENVIRONMENT

Maintenance of appropriate base flows of fresh water to rivers and downstream estuaries should be an essential component of the Lower West Coast water supply planning process. Estuaries receive inflows of fresh water from rivers, upstream wetlands, and ground water discharges. Riverine input varies in volume, with largest flows occurring during the wet season and lowest flows occurring at the end of the dry season. Estuarine salinity varies in relationship to the amount of fresh water discharged into the system, with the saltwater/freshwater interface moving down the estuary during high flow conditions, and moving up the estuary during low flow conditions.

Estuarine biota are well adapted to natural seasonal changes in salinity. The temporary storage and concurrent decrease in velocity of flood waters within upstream wetlands aid in controlling the timing, duration and size of freshwater flows into the estuary. Upstream wetlands and their associated ground water systems serve as freshwater reservoirs for the maintenance of base flow discharges into the estuaries, providing favorable salinities for estuarine biota. During the wet season, upstream wetlands provide pulses of organic detritus which are exported down stream to the brackish water zone. These materials are an important link in the estuarine food chain.

Estuaries are important as nursery grounds for many commercially important fish species. Many freshwater wetland systems in the planning area provide base flows to extensive estuarine systems in Lee, Collier, and Monroe counties. Wetlands as far inland as the Okaloacoochee Slough in Hendry County contribute to the base flows entering some of these estuarine systems. Maintenance of these base flows is crucial to propagation of many fish species that are the basis of extensive commercial and recreational fishing industries.

The estuarine environment is sensitive to freshwater releases, and disruption of the volume, distribution, circulation, temporal patterns of freshwater discharges could place severe stress on the entire ecosystem. "Such salinity patterns affect productivity, population distribution, community composition, predator-prey interactions, and food web structure in the inshore marine habitat. In many ways, salinity is a master ecological variable that controls important aspects of community structure and food web organization in coastal systems" (Myers and Ewel, 1990). Other aspects of water quality, such as turbidity, dissolved oxygen content, nutrient loads, and toxins, also affect functions of these areas (USFWS, 1990; USDA, 1989; Myers and Ewel, 1990).

OUTSTANDING NATURAL SYSTEMS

The Outstanding Natural Systems (ONS) concept and map (Plate 2) were developed at the direction of the Lower West Coast Water Supply Plan Advisory Committee. The map was prepared to identify large natural systems which should be preserved to ensure the ecological integrity of the region. The Advisory Committee selected a subcommittee to prepare the map, which was composed of representatives from public utilities, environmental groups, the agricultural community, Big Cypress Basin, the SFWMD, Florida Game and Fresh Water Fish Commission, U.S. Geological Survey, and county governments.

The ONS areas identified were predominately wetlands, due to their sensitivity to hydrologic changes. Uplands were included where they formed a mosaic with wetlands and/or provided corridor links between wetlands. In a few instances, uplands were included because they were known to support endangered species. The inclusion of lands on the map does not automatically preclude further development of these areas, nor does the exclusion of any natural areas from the map lessen their existing level of protection.

The map identifies two categories of ONS lands: ONSe and ONSm. The ONSe lands are areas that have been purchased for environmental preservation/ conservation purposes. The ONSm lands are natural systems that are used for multiple purposes (i.e., agriculture, residential, water supply, surface water management, etc.).

The process and specific criteria used to prepare the ONS map, as well as implementation strategies for the map, are further discussed in Chapter I of the LWC Planning Document.

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